

We claim:

1. A computerized method for prefetching object data comprising:  
creating a structure context description identifying a structure context that comprises a  
5 set containing at least one object, said objects having an attribute;  
associating the structure context description with each object in the set; and  
fetching related object data for objects in the set by a data storage system from a  
physical storage system upon an access to an attribute of one object in the set.
- 10 2. The computerized method of claim 1, wherein the set is selected from the group  
consisting of: a collection, an array, a table, a record structure, and a query result set.
3. The computerized method of claim 1, wherein the related object data comprises an  
attribute of at least one object in the set of objects, said attribute corresponding to a first  
15 attribute accessed in the first object.
4. The computerized method of claim 1, further comprising providing a hint specifying  
whether to enable or disable the fetch of related object data for objects in the set from a  
physical storage system upon an access to an attribute of one object in the set.
- 20 5. The computerized method of claim 4, wherein the hint is specified using a mechanism

selected from the group consisting of: a parameter to a function to enable the fetch for the duration of the function, a function to enable or disable the fetch, an environment variable to enable or disable the fetch, and a label on a structure type to enable or disable the fetch for objects that conform to the structure type.

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6. The computerized method of claim 1, further comprising storing the related object data in a cache.

7. The computerized method of claim 6, wherein the cache is located in a memory

10 allocated to a client application.

8. The computerized method of claim 6, wherein the cache is located in a memory allocated to the data storage system.

15 9. The computerized method of claim 6, wherein the cache is located in a memory allocated to the physical storage system used by the data storage system.

10. The computerized method of claim 1, wherein the data storage system is an object-oriented database system.

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11. The computerized method of claim 10, wherein the object-oriented database system is

implemented using a physical storage system comprising a relational database system.

12. The computerized method of claim 11, wherein the structure context is stored in a first table of the relational database and the attribute data is stored in a second table of the

5 relational database.

13. The computerized method of claim 12, wherein the related object data comprises an attribute stored in a second table of the relational database and wherein fetching related object data further comprises performing a database join of the first table and the second table.

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14. The computerized method of claim 11, wherein the structure context is created by retrieving rows from the relational database such that the rows identify objects contained in the structure context and storing those rows in the relational database.

15 15. The computerized method of claim 1, wherein the data storage system is an object repository.

16. The computerized method of claim 15, wherein the object repository implements an application programming interface of Microsoft Repository.

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17. The computerized method of claim 1, wherein the data storage system is selected from

the group consisting of: an entity-relationship model, a semantic data model, and a network data model.

18. The computerized method of claim 1, further comprising deleting the structure context  
5 description at a predetermined time.

19. The computerized method of claim 18, wherein the predetermined time occurs when there are no objects that reference the structure context remembered by the structure context description.

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20. The computerized method of claim 1, wherein fetching related object data for the set and accessing an attribute of the first object occur asynchronously.

21. A computerized method for prefetching object data comprising:

15 creating a structure context description identifying a structure context that is the set of data items in an object;

associating the structure context description with each data item in the object; and

fetching related data items in the object by a data storage system from a physical storage system upon an access to a data item in the object.

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22. The computerized method of claim 21, wherein the data storage system is an object-

oriented database.

23. The computerized method of claim 21, wherein the data storage system is an object repository.

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24. The computerized method of claim 23, wherein the repository implements an application programming interface of Microsoft Repository.

25. The computerized method of claim 21, wherein the data item is an attribute.

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26. The computerized method of claim 21, wherein the data item is a collection of attributes.

27. The computerized method of claim 21, wherein the related data items are fetched into  
15 a cache that is maintained by the data storage system.

28. The computerized method of claim 1, wherein the attribute is a collection.

29. The computerized method of claim 1, wherein the structure context is a collection.

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30. The computerized method of claim 1, wherein each object implements a COM

interface and wherein each attribute is a COM property.

31. A computerized system comprising:

a computer comprising a processor, a memory, and a computer-readable medium

5 operatively coupled together;

an operating environment executing in the processor from the computer-readable medium;

a persistent storage system operative to store objects having attributes and structures;

and

10 a data storage system executing in the processor from the computer-readable medium

and under the control of the operating environment, said data storage system operative to

maintain objects in the persistent storage system and further operative to fetch a data item

from each object in a structure containing a plurality of objects upon a fetch to the

corresponding data item in a first object in the structure.

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32. The computerized system of claim 31, wherein the data storage system is further

operative to create a structure context description identifying the objects in the structure.

33. The computerized system of claim 31, further comprising a cache for storing the data

20 item from each object in the structure.

34. The computerized system of claim 33, wherein the cache is located in an application

program's memory space.

35. The computerized system of claim 33, wherein the cache is located in the data storage system's memory space.

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36. The computerized system of claim 33, wherein the cache is located in the physical storage system's memory space.

37. A computer-readable medium having computer-executable instructions to cause a  
10 computer to perform a method comprising:  
creating a structure context description identifying a set containing at least one object,  
said objects having an attribute, said attribute having a name; and  
associating the structure context description with each data item in the object; and  
fetching related object data for the set by a data storage system from a physical storage  
15 system upon an access to an attribute of the first object.

38. The computer-readable medium of claim 37, wherein the set is selected from the group consisting of: a collection, an array, a table, a record structure, and a query result set.

20 39. The computer-readable medium of claim 37, wherein the related object data comprises an attribute of at least one object in the set of objects, said attribute having the same name as

an attribute accessed in the first object.

40. The computer-readable medium of claim 37, further comprising providing a hint specifying whether to enable or disable the fetch of related object data for objects in the set  
5 from a physical storage system upon an access to an attribute of one object in the set.

41. The computer-readable medium of claim 40, wherein the hint is specified using a mechanism selected from the group consisting of: a parameter to a function to enable the prefetch for the duration of the function, a function to enable or disable the fetch, an  
10 environment variable to enable or disable the fetch, a label on a structure type to enable or disable the fetch for objects that conform to the structure type.

42. The computer-readable medium of claim 37, further comprising storing the related object data in a cache.  
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43. The computer-readable medium of claim 42, wherein the cache is located in a memory allocated to a client application.

44. The computer-readable medium of claim 42, wherein the cache is located in a memory  
20 allocated to the data storage system.



45. The computer-readable medium of claim 42, wherein the cache is located in a memory allocated to the physical storage system.

46. The computer-readable medium of claim 37, wherein the data storage system is an  
5 object-oriented database.

47. The computer-readable medium of claim 46, wherein the object-oriented database is implemented using a physical storage system comprising a relational database system.

10 48. The computer-readable medium of claim 47, wherein the structure context is stored in a first table of the relational database and the attribute data is stored in a second table of the relational database.

49. The computer-readable medium of claim 48, wherein the related object data comprises  
15 an attribute stored in a second table of the relational database and wherein fetching related object data further comprises performing a database join of the first table and the second table.

50. The computer-readable medium of claim 48, wherein creating a structure context comprises retrieving rows from the relational database such that the rows identify objects  
20 contained in the structure context and storing those rows in the relational database.

51. The computer-readable medium of claim 37, wherein the data storage system is an object repository.

52. The computer-readable medium of claim 51, wherein the object repository implements  
5 an application programming interface of Microsoft Repository.

53. The computer-readable medium of claim 37, wherein the data storage system is selected from the group consisting of: an entity-relationship model, a semantic data model, and a network data model.

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54. The computer-readable medium of claim 37, further comprising deleting the structure context description at a predetermined time.

55. The computer-readable medium of claim 54, wherein the predetermined time occurs  
15 when there are no objects that reference the structure context remembered by the structure context description.

56. The computer-readable medium of claim 37, wherein the fetching of related object data for the set and the access to an attribute of the first object occur asynchronously.

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57. A computer-readable medium having computer-executable instructions for performing

a method comprising:

creating a structure context description identifying a structure context that is the set of data items in an object;

associating the structure context description with each data item in the object; and

5 fetching related data items in the object by a data storage system from a physical storage system upon an access to a data item in the object.

58. The computer-readable medium of claim 57, wherein the data storage system is an object-oriented database.

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59. The computer-readable medium of claim 57, wherein the data storage system is an object repository.

60. The computer-readable medium of claim 57, wherein the object repository implements  
15 an application programming interface of Microsoft Repository.

61. The computer-readable medium of claim 57, wherein the data item is an attribute.

62. The computer-readable medium of claim 57, wherein the data item is a collection of  
20 attributes.

63. The computer-readable medium of claim 57, wherein the cache is maintained in a persistent storage system used by the data storage system.

64. The computer-readable medium of claim 37, wherein the attribute is a collection.

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65. The computer-readable medium of claim 37, wherein the structure context is a collection.

66. The computer-readable medium of claim 37, wherein each object implements a COM

10 interface and wherein each attribute is a COM property